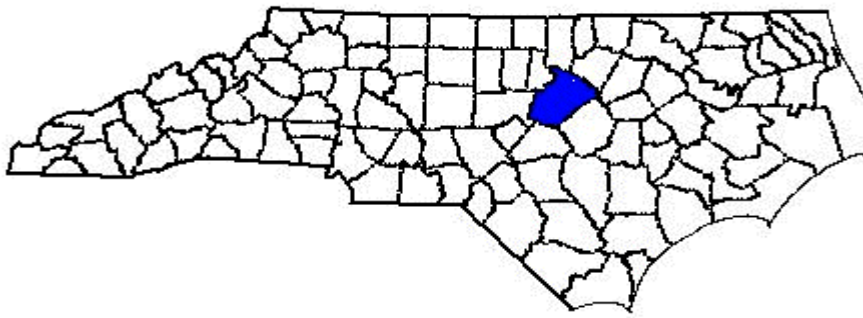


# ANNUAL REPORT FOR 2002



**New Light Creek Mitigation Site  
Wake County  
Project No. 8.U401721  
TIP No. R-2000 WM**



Prepared By:  
Office of Natural Environment & Roadside Environmental Unit  
North Carolina Department of Transportation  
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## Summary

The following report summarizes the monitoring activities that have occurred in the past year at the New Light Creek Mitigation Site. This site was originally constructed in 1998. Monitoring activities in 2002 represent the fourth year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success for a minimum of five years.

In 2002, four additional monitoring gauges were installed, based on agency comments and review. Now New Light Creek site contains ten monitoring gauges, one onsite rain gauge, and four vegetation plots.

This report utilizes rainfall data from both a local weather station and from an on-site rain gauge. Beginning in May 2000, rainfall has been recorded an on-site rain gauge. Historical data is provided by the NC State Climate Office from the Raleigh/Durham weather station.

Hydrologic monitoring indicated that four of the ten monitoring gauges indicate optimum saturation for more than 12.5% of the growing season. Four gauges, GW-1, GW-2, GW-3, and GW-5 have met the success criteria of 29 consecutive days exceeding at least 12.5% of the growing season.

Tree planting was performed on the approximately 13.2 acres on this site. There were 4 vegetation-monitoring plots established throughout the site. Based on the results of the fourth year of monitoring, the site revealed an average tree density of 534 trees per acre, well above the minimum required by the success criteria.

Based on the monitoring results from the 2002 growing season, NCDOT recommends that hydrologic and vegetation monitoring continue.

## 1.0 Introduction

### 1.1 PROJECT DESCRIPTION

The New Light Creek Mitigation Site is located east of Magnum Dairy Road (SR 1911) adjacent to New Light Creek in Wake County near the Granville county line (Figure 1). This site was constructed to provide mitigation for wetland impacts associated with the Raleigh Outer Loop (R-2000).

The site, totaling 19.8 acres in size, consists of the creation and restoration of a bottomland hardwood forest. The site was constructed in 1998 and planted in 1999.

### 1.2 PURPOSE

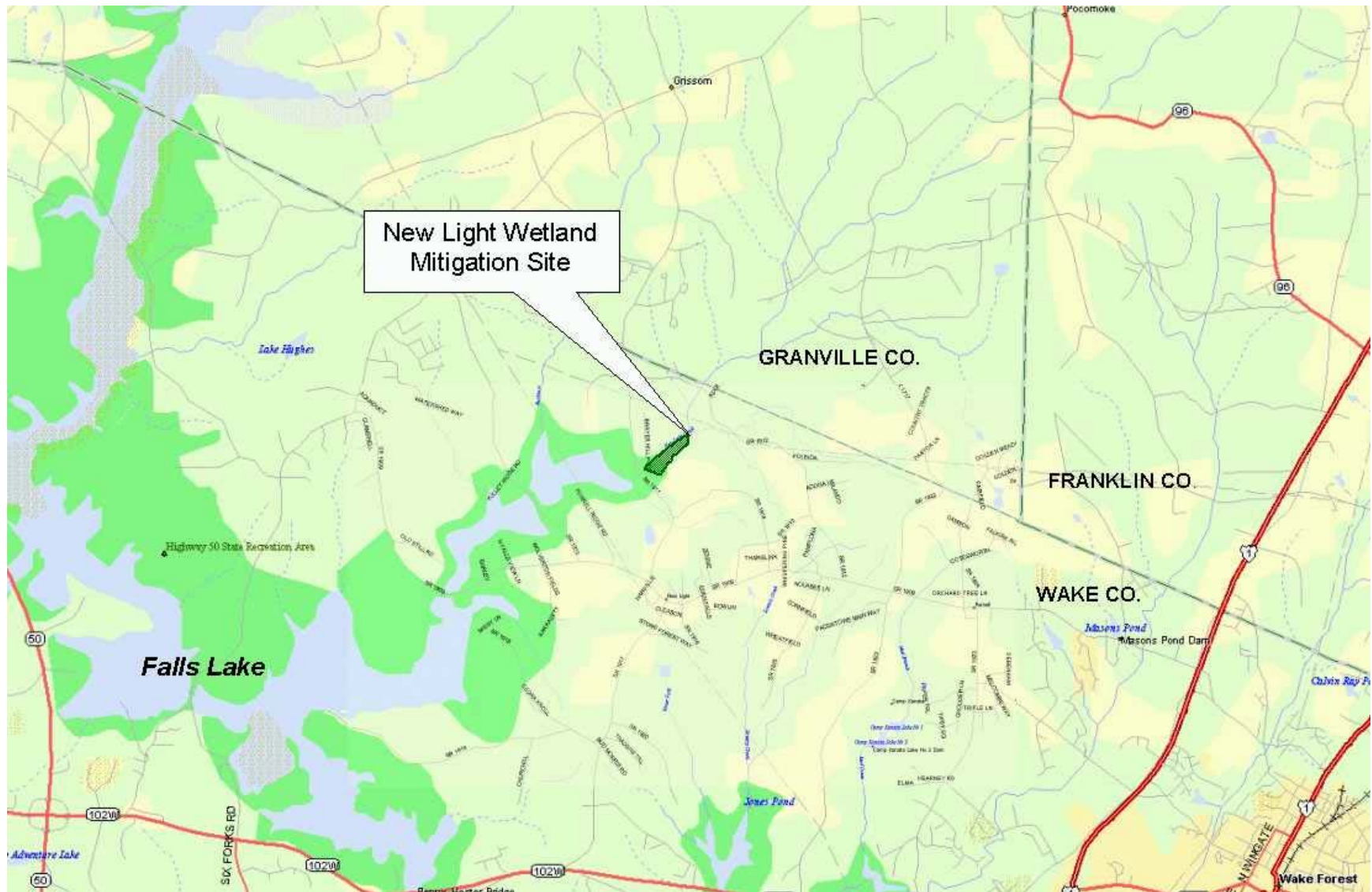
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2002 growing season at the New Light Creek Mitigation Site.

Activities in 2002 reflect the fourth year of monitoring following the restoration efforts. Included in this report are analyses of both hydrologic and vegetative monitoring results as gauge as local climate conditions throughout the growing season and site photographs.

### 1.3 PROJECT HISTORY

October 1998	Site grading commenced
February 1999	Site Planted
March 1999	Monitoring Gauges Installed
March- November 1999	Hydrologic Monitoring (1 yr.)
September 1999	Vegetation Monitoring (1 yr.)
March- November 2000	Hydrologic Monitoring (2 yr.)
November 2000	Vegetation Monitoring (2 yr.)
March- November 2001	Hydrologic Monitoring (3 yr.)
July 2001	Vegetation Monitoring (3 yr.)
March- November 2002	Hydrologic Monitoring (4 yr.)
June 2002	Vegetation Monitoring (4 yr.)

Figure 1. Site Location Map



## **1.4 DEBIT LEDGER**

The entire New Light Creek mitigation site was used for projects R-2000EA and R2000EB to compensate for unavoidable wetland impacts related to roadway projects.

## **2.0 Hydrology**

### **2.1 SUCCESS CRITERIA**

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Area inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Wake County begins March 26 and ends November 10. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 26 and before November 10.<sup>1</sup> The growing season is 229 days; therefore, optimum hydrology requires 12.5% of this season, or at least 29 consecutive days. Local climate must also represent average conditions for the area.

### **2.2 HYDROLOGIC DESCRIPTION**

In March of 1999, six groundwater-monitoring gauges were installed across the site (Figure 2). Four additional groundwater-monitoring gauges were installed in February 2002. The automatic monitoring gauges record daily readings of groundwater depth.

The New Light Creek site was designed to receive hydrologic input from rainfall. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

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<sup>1</sup> Natural Resources Conservation Service, Soil Survey of Wake County, North Carolina.

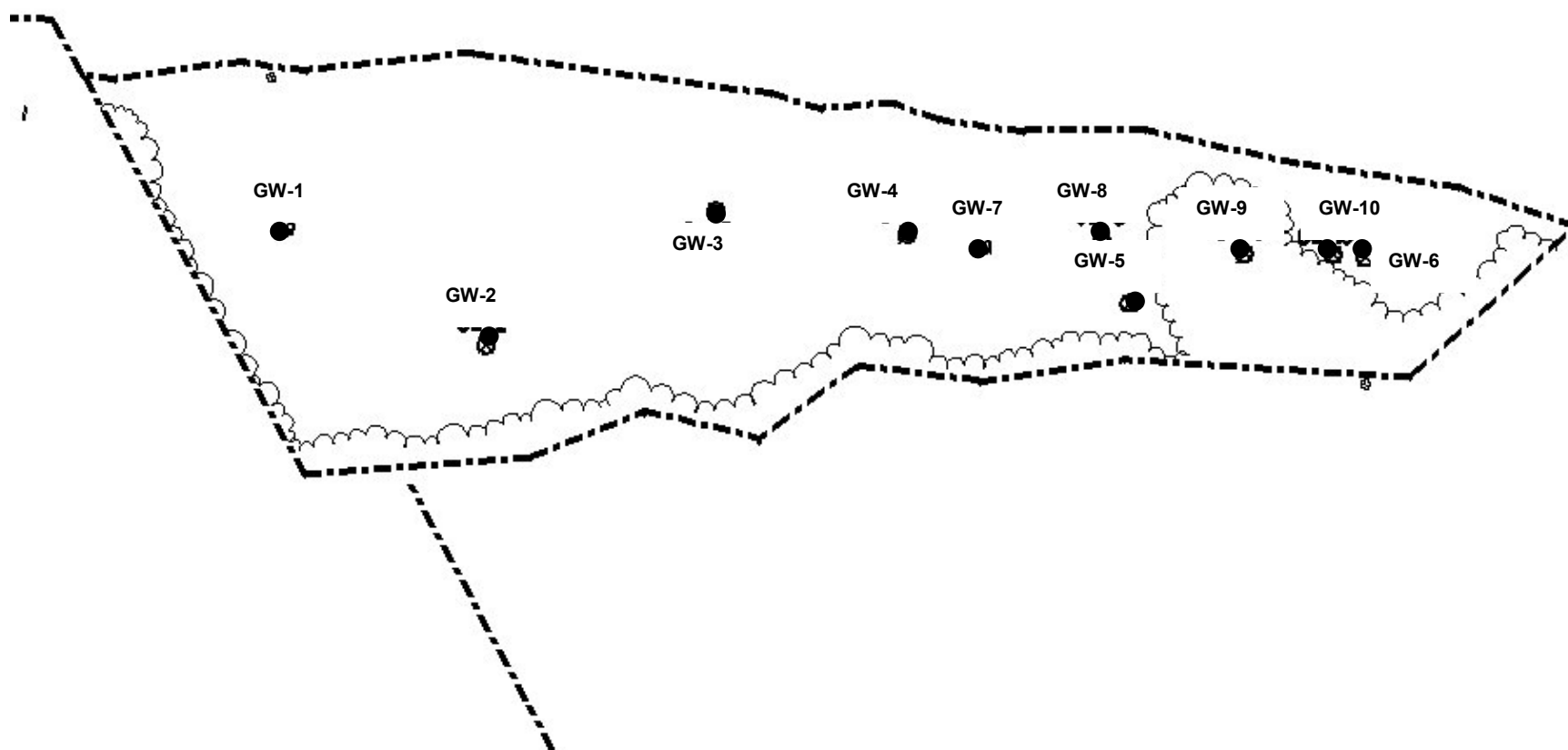


Figure 2. Monitoring Gauge Location Map



## **2.3 RESULTS OF HYDROLOGIC MONITORING**

### **2.3.1 Site Data**

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 229-day growing season (March 26 – November 10). The results are presented in Table 1.

Appendix A contains a plot of the groundwater depth for each monitoring gauge during 2002. The maximum number of consecutive days is noted on each graph. The individual precipitation events, shown on the monitoring well graphs as bars, represent data collected from the Infinity rain gauge

In February of this year four new ground water gauges (GW-7, GW-8, GW-9, GW-10) were installed. These gauges were installed between existing gauges that were either not meeting success or were marginal in success based on previous years monitoring

Figure 3 represents a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red indicate saturation between 8 and 12.5% of the season, while those in green indicate saturation between 5 and 8% of the season. Gauges highlighted in black indicate no wetland hydrology (less than 5% of the growing season).

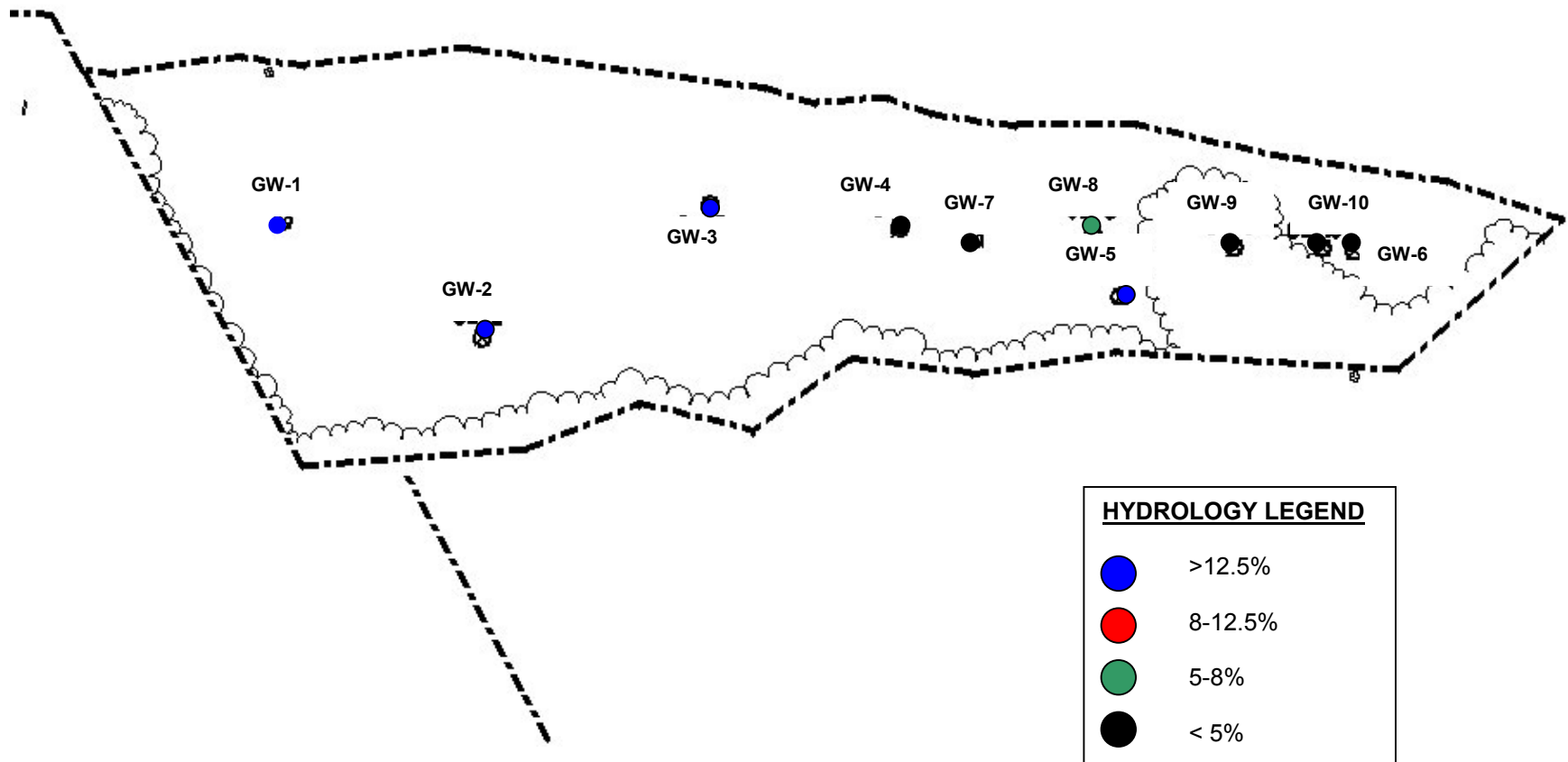
Table 1. New Light Creek Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
GW-1				✓	13.1	Oct 12-Nov 10
GW-2				✓	30.6	March 26-June 3 Oct 11-Nov 10
GW-3				✓	13.5	March 26-April 25 Oct 12-Nov 10
GW-4	✓				4.4	
GW-5				✓	23.1	March 26-May 17
GW-6	✓				3.1	
GW-7	✓				1.8	
GW-8		✓			5.7	
GW-9	✓				3.1	
GW-10	✓				1.3	

*Specific Gauge Problems:*

- **GW-5** experienced data loss (September 7 to November 10) due to gauge malfunction.
- **GW-6** stopped recording data (March 22-May 6), and was replaced.
- **GW-7** experienced data loss (June 10-July 1) due to gauge malfunction.

**Figure 3. Monitoring Gauge Hydrologic Results**



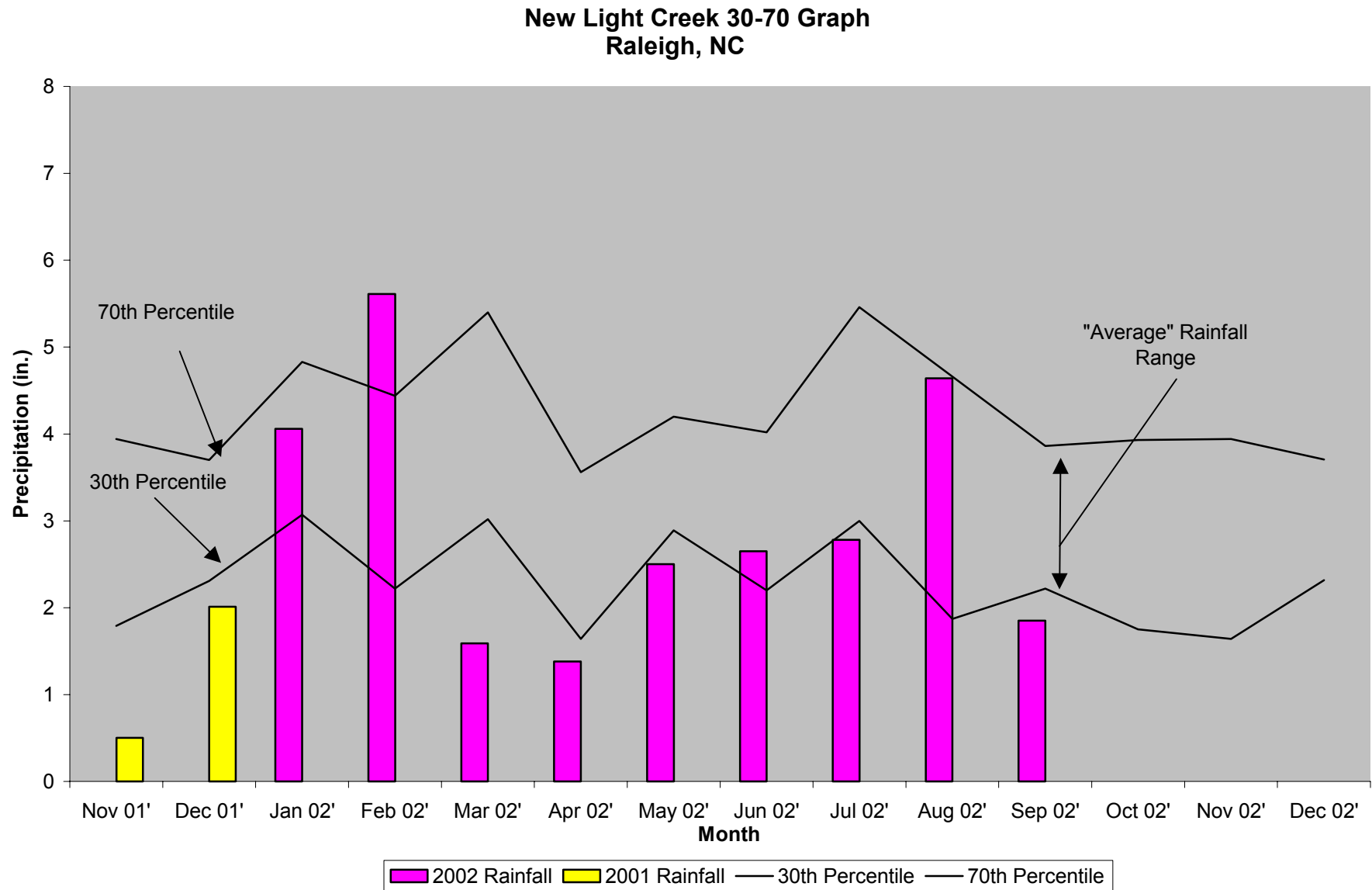
### **2.3.2 Climatic Data**

Figure 4 represents an examination of the local climate in comparison with historical data in order to determine whether 2002 was “average” in terms of climate conditions. The two lines represent the 30<sup>th</sup> and 70<sup>th</sup> percentiles of monthly precipitation for Raleigh. The bars are the monthly rainfall totals for November 2001 through October 2002. The historical data was collected by the NC State Climate Office. Months with below average rainfall include November (2001), December (2001), March, April, May, July, and September. January and August experienced normal rainfall. February experienced above normal rainfall. No data is available for November or December 2002. Overall the site experienced below average rainfall in 2002.

### **2.4 CONCLUSIONS**

2002 represents the fourth full growing season that the hydrologic data has been examined. Four gauges, GW-1, GW-2, GW-3, and GW-5 have met the success criteria of consecutive days exceeding at least 12.5% of the growing season. GW-8 indicates saturation between 5 to 8% of the growing season. Gauges GW-4, GW-6, GW-7, GW-9, GW-10 do not indicate successful hydrology. This may be due to the site experiencing below average rainfall during 2002. NCDOT proposes to continue monitoring this site, to examine the results of the new gauge installation during normal rainfall conditions.

Figure 4.



### **3.0 Vegetation: New Light Creek Mitigation Site (Year 4 monitoring)**

#### **3.1 SUCCESS CRITERIA**

NCDOT will monitor the site for five years or until success criteria is met. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

#### **3.2 DESCRIPTION OF SPECIES**

The following species were planted in the Wetland Enhancement/Preservation Area:

##### **Bottomland Hardwood Area (12.2 Ac.)**

*Quercus phellos*, Willow Oak  
*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak  
*Fraxinus pennsylvanica*, Green Ash  
*Nyssa sylvatica*, Blackgum  
*Quercus lyrata*, Overcup Oak  
*Quercus michauxii*, Swamp Chestnut Oak

##### **Levee Area (1.0 Ac.)**

*Betula nigra*, River Birch  
*Quercus lyrata*, Overcup Oak  
*Quercus phellos*, Willow Oak  
*Platanus occidentalis*, Sycamore  
*Juglans nigra*, Black Walnut

### 3.3 RESULTS OF VEGETATION MONITORING

**Table 2.** Vegetation Monitoring Statistics, by plot

Plot # (Type)	Blackgum	Cherrybark Oak	Green Ash	Overcup Oak	Swp. Chestnut Oak	Willow Oak	Black Walnut	Total (4 year)	Total (at planting)	Density (Trees/Acre)
1 (B L H / Levee)	1	2		3	10	5	8	29	37	533
2 (B L H )		5	2	15	4	5		31	38	555
3 (B L H )	3	8	11	2				24	34	480
4 (B L H )	2	2	6	4	15	2		31	37	570
AVERAGE DENSITY										534

**Site Notes:** Volunteer green ash and sycamore found throughout site. Heavy grasses and ground cover exist throughout the site including fescue, smartweed, horse-nettle, *Juncus* sp., *Carex* sp., poison ivy, and pokeweed.

The swale in the middle of the site with a slightly lower elevation contains various wetland species including *Juncus* sp., *Scirpus* sp., *Cyperus* sp., black willow, and cattail. Standing water is present throughout this middle swale. This swale was established during construction of the site and is described and shown in the attached page and map taken from the June 1998 mitigation plan.

### 3.4 CONCLUSIONS

Of the 19.8 total acres on this site, approximately 13.2 acres involved tree planting. There were 4 vegetation monitoring plots established throughout the site. The 2002 vegetation monitoring of the site revealed an average tree density of 534 trees per acre, well above the minimum required by the success criteria.

NCDOT and USACE personnel inspected the washout along the streambank in June 2000. It was agreed that NCDOT would repair the washout. This work was not done. A site inspection in September 2000 revealed this washout to be stabilizing on its own. NCDOT has continued to monitor this area to determine if this slope will stabilize given time. The streambank was inspected and photographed during the 2002 monitoring visit and no other signs of erosion were observed (see pictures 5 and 6).

NCDOT supplementally planted the stream bank levee with the following species: sycamore, cherrybark oak, and water oak due to the beaver damage of existing trees on site. No recent beaver activity was observed at the time of monitoring.

NCDOT will continue vegetation monitoring at the New Light Creek Mitigation Site.

## **4.0 OVERALL CONCLUSIONS**

2002 represents the fourth full growing season that the hydrologic data has been examined. Four gauges, GW-1, GW-2, GW-3, and GW-5 have met the success criteria of consecutive days exceeding at least 12.5% of the growing season. GW-8 indicates saturation between 5 to 8% of the growing season. Gauges GW-4, GW-6, GW-7, GW-9, GW-10 does not indicate successful hydrology. These gauges did however rebound once rainfall levels increased near the end of the growing season.

All of the vegetation monitoring plots indicated an average tree density of 534 trees per acre.

Based on the monitoring results from the 2002-growing season, NCDOT will be re-evaluating this site. Monitoring hydrology and vegetation of this site will continue in 2003.



**APPENDIX A**

**DEPTH TO GROUNDWATER GRAPHS**

**APPENDIX B**

**SITE PHOTOS & VEGETATION PLOT LOCATIONS**





Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6





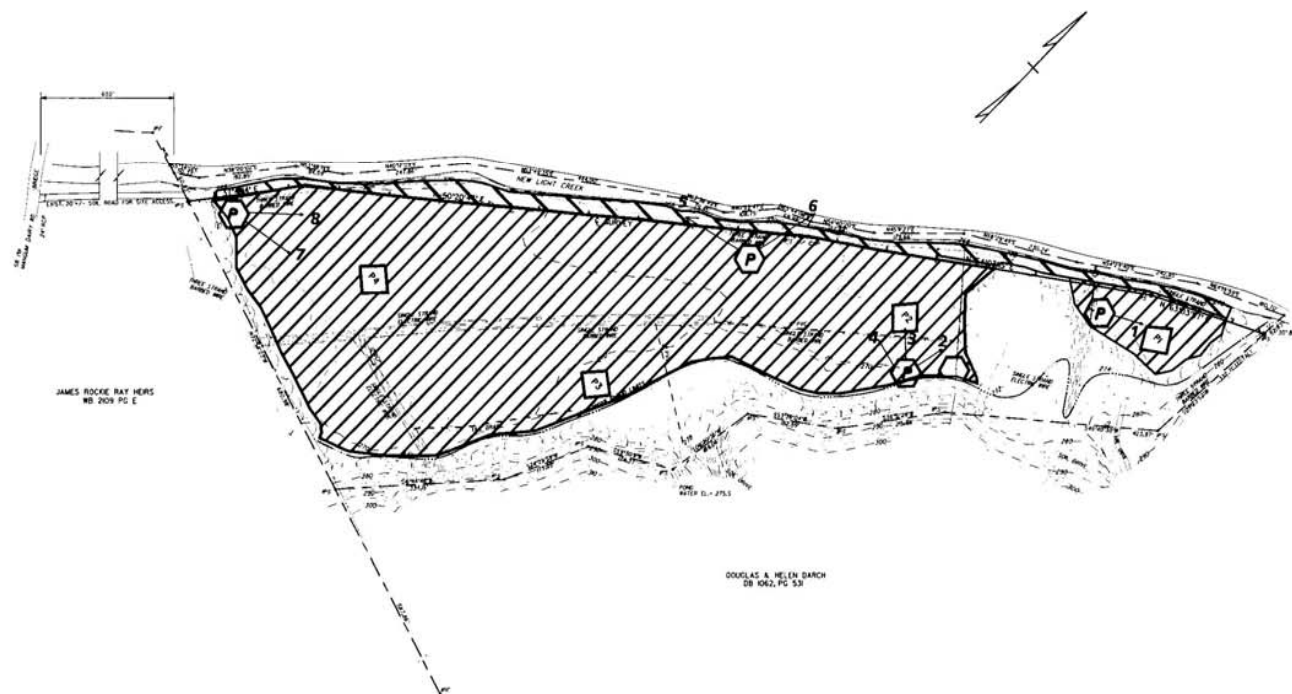
Photo 7



Photo 8

# **NEW LIGHT CREEK MITIGATION SITE VEGETATIVE PLOT AND PHOTO POINT LOCATIONS**

50 0 100 SCALE 1" = 100'	R-2000WM
REVISIONS	



- |  |   |
|--|---|
|  <b>PHOTO POINTS</b>                |  <b>Bottomland Hardwood Area</b> |
|  <b>VEGETATION MONITORING PLOTS</b> |  <b>Levee Area</b>               |